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(71) Applicant
Andrew John Skilling,
74, Walton Road,
Frinton-on-Sea,
Essex
(72) Inventor
Andrew John Skilling
(74) Agent and/or address for service
Sanderson & Co,
97, High Street,
Colchester,
CO1 1TH,
Essex

(54) **A storm-water by-pass**

(57) A storm-water by-pass for an oil interceptor chamber 69 of a drainage system comprises a first chamber 60 within which is mounted a second chamber 61 having apertures such as 64 adjacent its lower edge. Inlet flow to the by-pass is though pipe 65, feeding the interior of the second chamber 61, and normally water is drained therefrom through pipe 68 into a separate or incorporated interceptor chamber 69. In the embodiment shown the outlet-dip pipe 74 from the chamber 69 is fed into a gallery 70, mounted around the interior of the first chamber 60 and thence to a drainage outlet 74, the gallery 70 having a wall 71 defining a weir, to handle excess water inlet flow conditions. Should the inlet (65) flow rate rise above a pre-determined amount, the head in the first chamber 61 and so also in the chamber 60 will rise, until flow over the weir commences, into the gallery 70, so by-passing the interceptor 69. Oil already separated within the interceptor will not be flushed through the interceptor by such abnormal flow conditions, nor will oil already separated within the second chamber 61. Modified chamber and weir arrangements as disclosed.

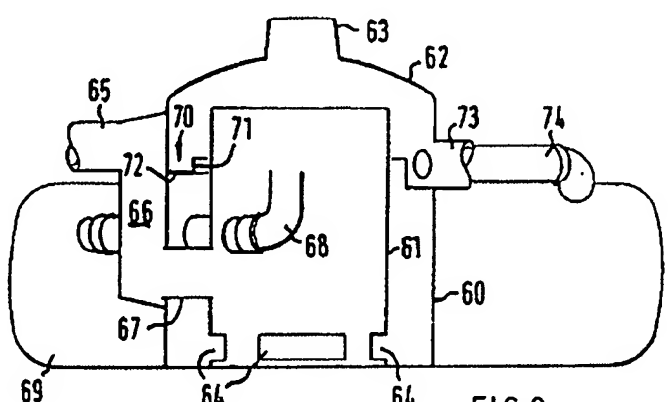

FIG.8

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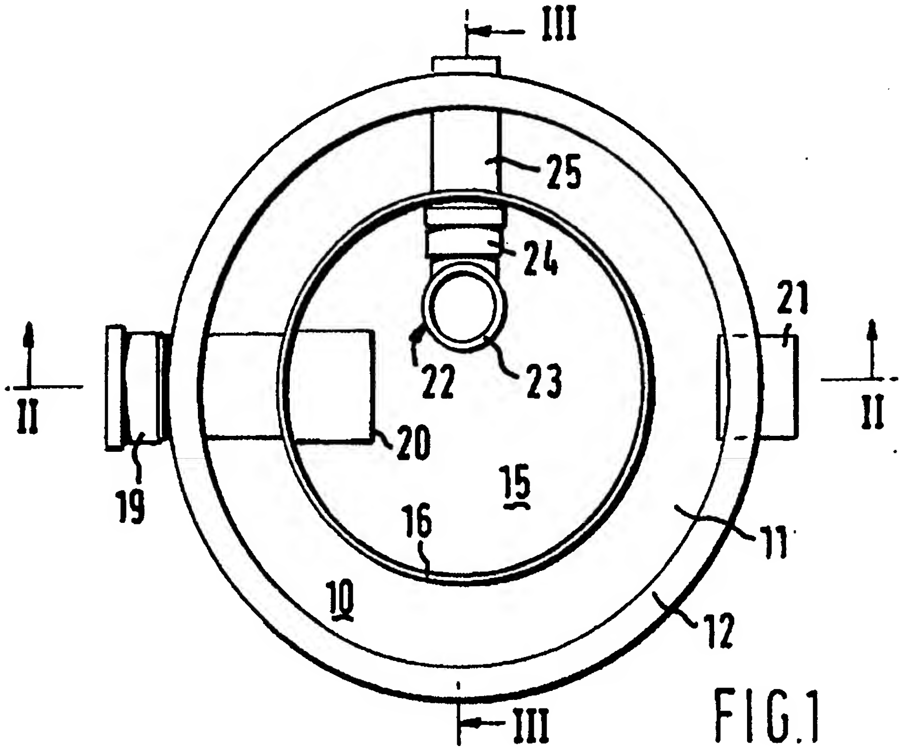
III
25
24
21
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23
II
II
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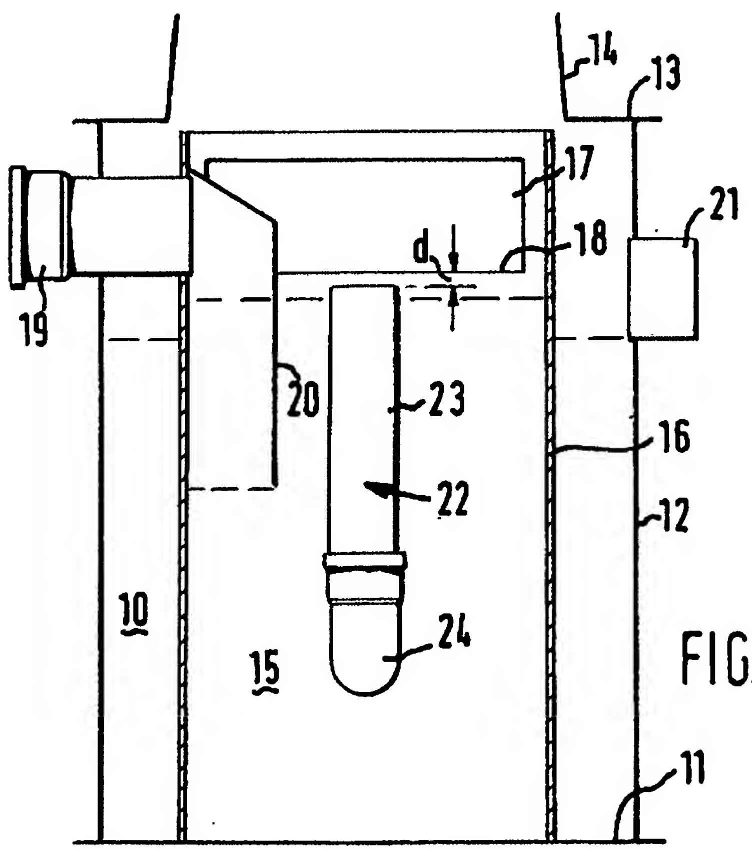
19
15
16
11
10
12
III

FIG.1


14
13
17
21
d
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19
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23
16
22
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10
24
15
11

FIG.2

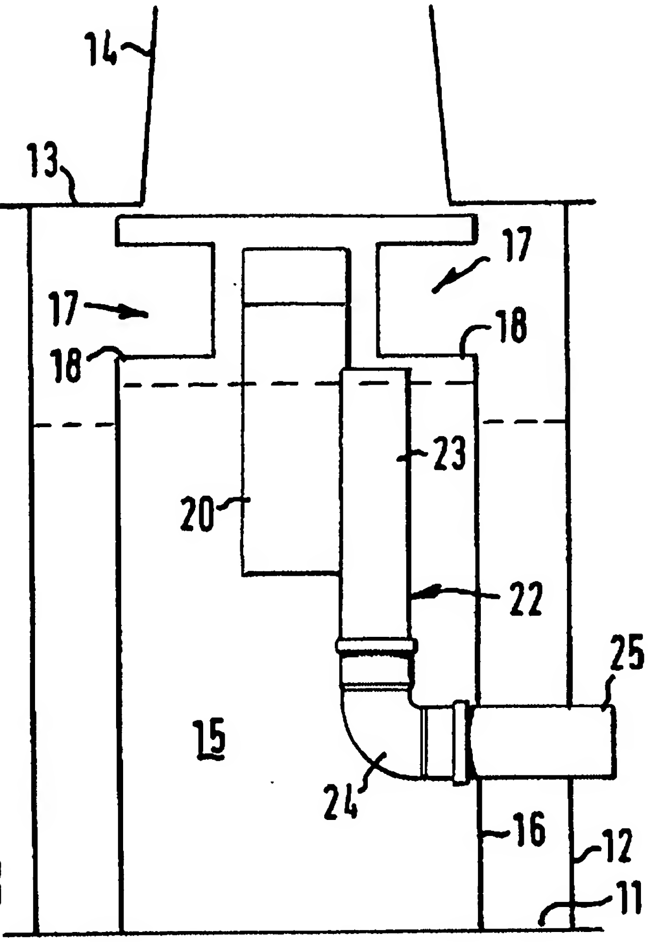


FIG.3

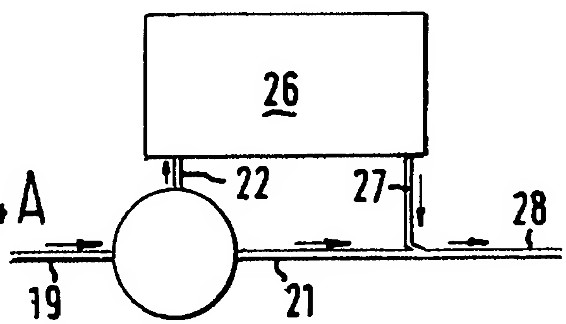


FIG.4A

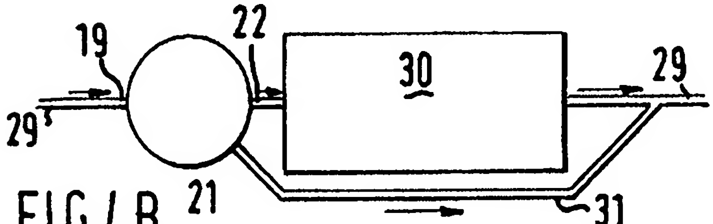
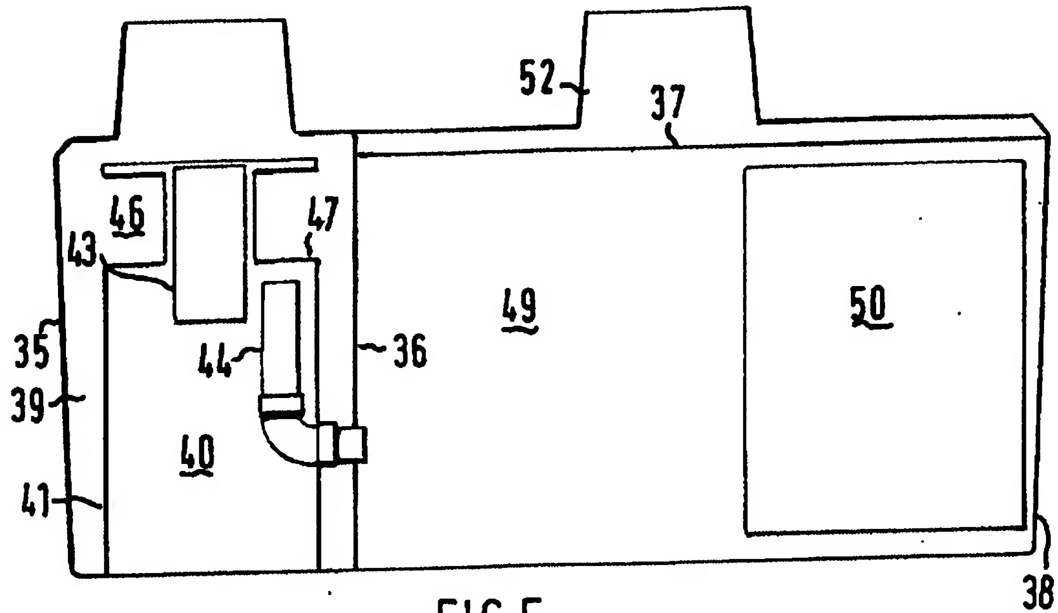


FIG.4B


52
37
46
47
43
49
50
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44
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39
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41
38

FIG.5

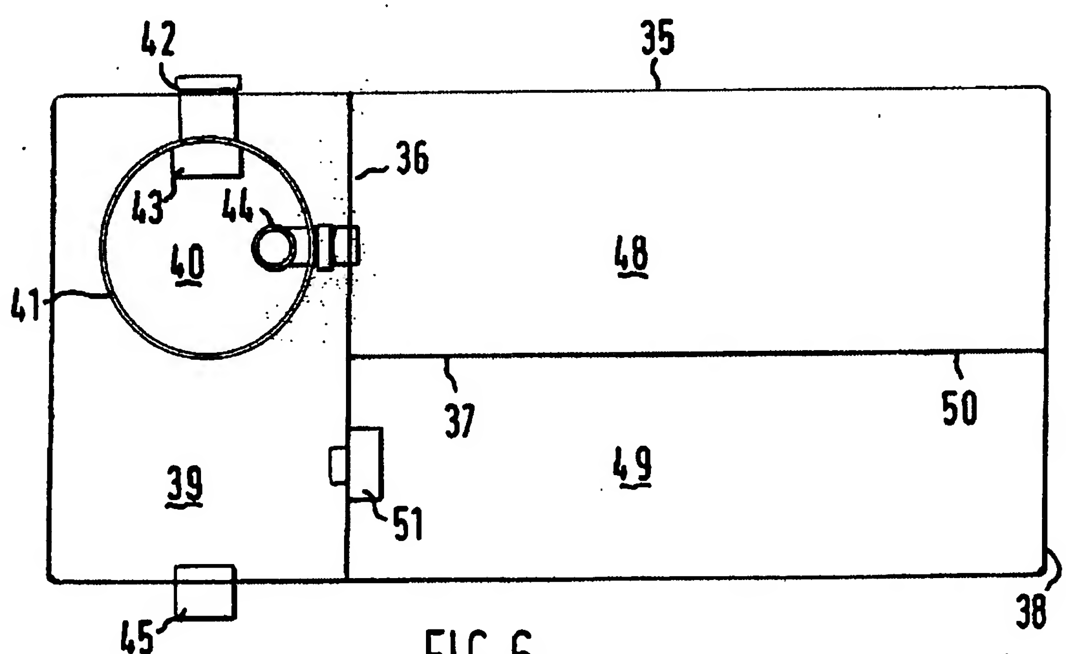
42
35
36
43
44
40
48
41
37
50
39
49
51
45
38

FIG.6

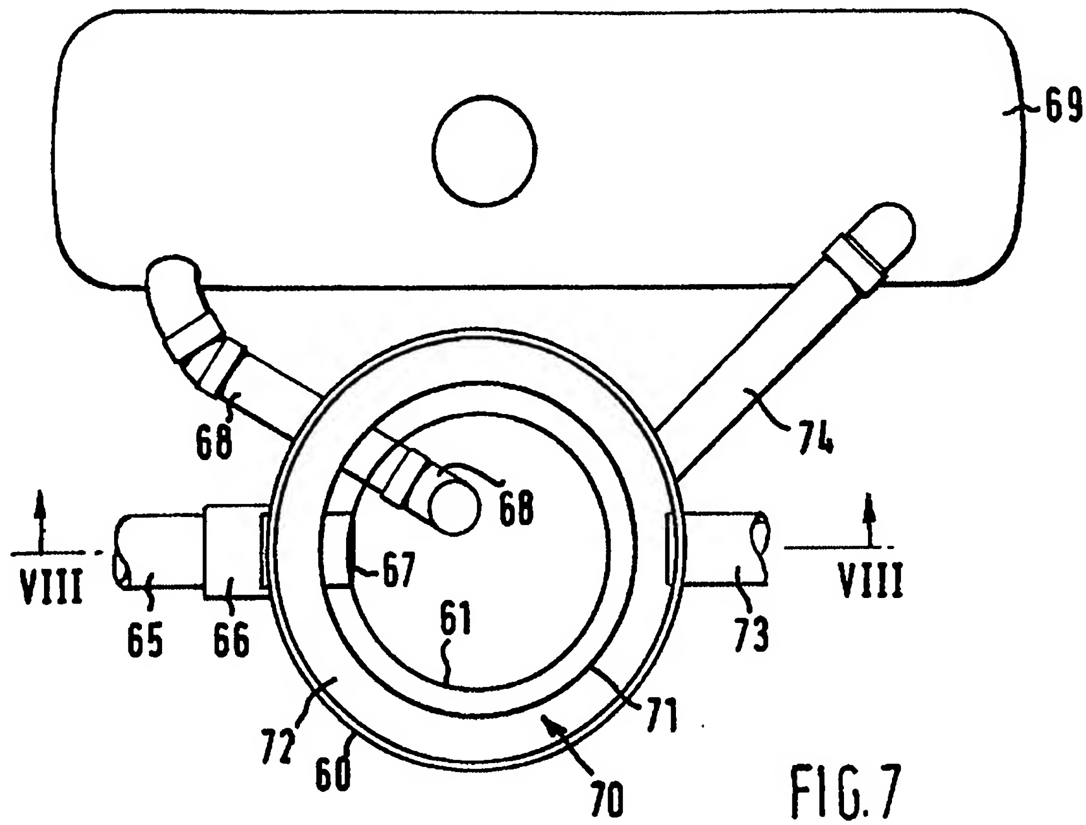
69
68
74
68
VIII
67
VIII
65
66
61
73
71
72
60
70

FIG.7

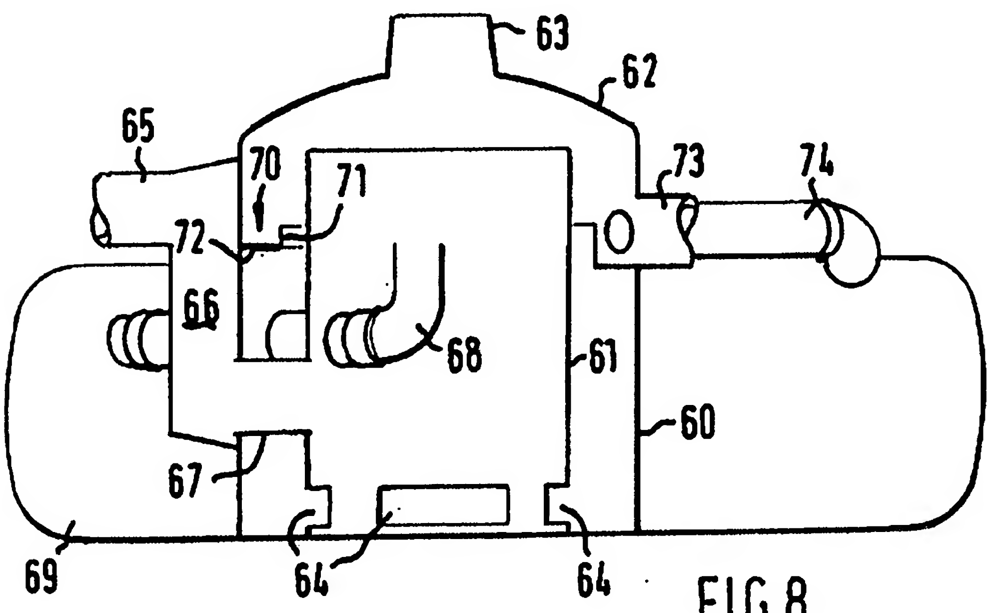
63
62
65
70
71
73
74
72
66
68
61
60
67
69
64
64

FIG.8

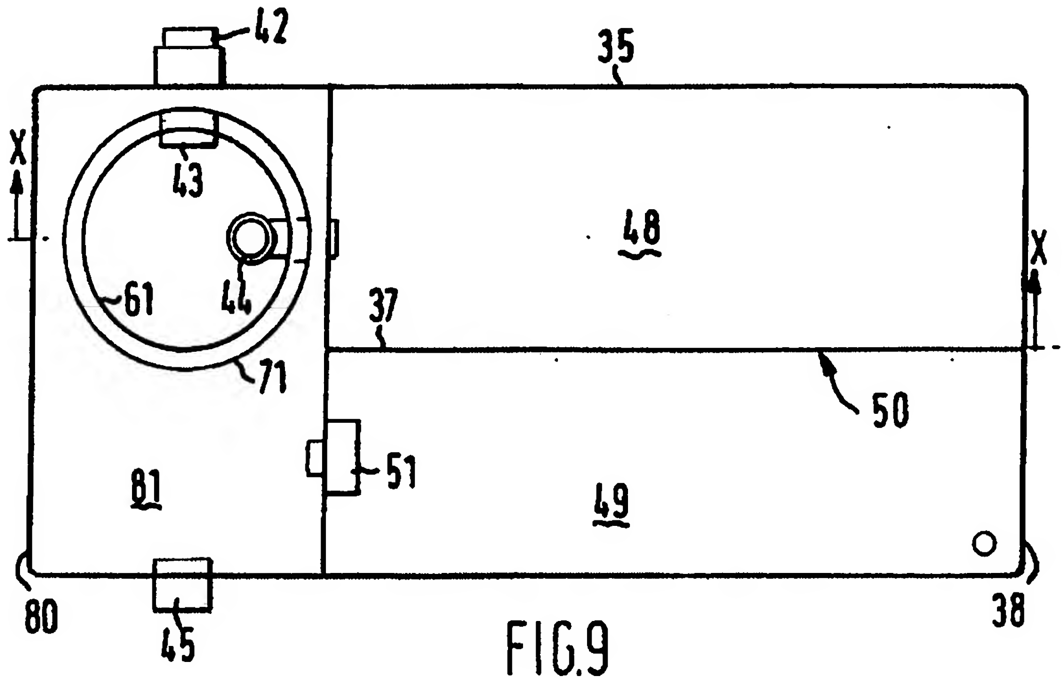
42
35
X
43
48
X
61
44
37
71
50
51
81
49
80
45
38

FIG.9

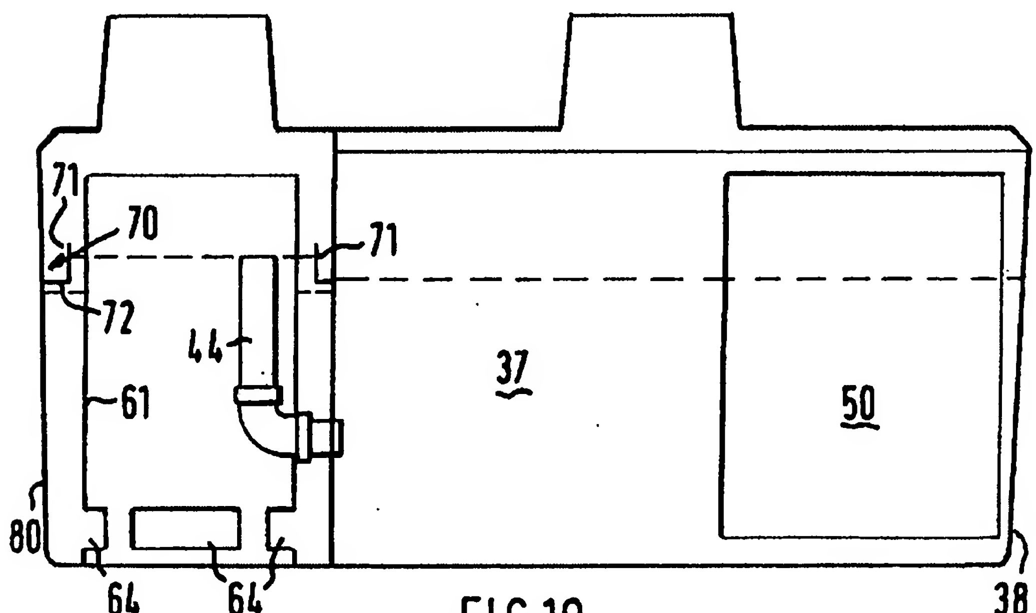
71
70
71
72
44
37
50
61
80
64
64
38

FIG.10

SPECIFICATION
A storm-water by-pass

This invention relates to a storm-water by-pass suitable for fitting into a drainage system, so as to permit an excessive water flow through the drainage system to by-pass equipment which normally processes water flowing therethrough.

The surface water draining from many industrial sites often is contaminated with oils. If such oils are permitted to flow into surface water drains, which normally feed direct into natural waterways such as rivers or lakes with no treatment, extensive pollution can be caused, leading to environmental damage. As a result, many local authorities are now insisting that surface water draining from an industrial site is treated so as to remove any oil therefrom, before that surface water is fed into a surface water drain. Such equipment able to separate oil from surface water drained from a site usually is referred to as an "interceptor".

Though there have been many designs proposed for interceptors, one common type has a separation chamber through which surface water is passed before being discharged to a surface water drain, the interceptor operating on the principle that oil naturally tends to separate from water and provided that contaminated water remains for a sufficiently long period in the separation chamber, any oil present will tend to float on the water in the chamber.

Water is discharged from the separation chamber from below the upper surface of liquid therein, so that the oil remains in the chamber, the oil then periodically being removed from the chamber in an appropriate manner.

When designing an interceptor installation, due attention must be paid to the volume of the interceptor chamber in relation to the expected volume flow rate for normal conditions, to ensure that surface water passing through the chamber remains in the chamber for a sufficiently long period to secure adequate separation. Moreover, if the chamber is too small for the expected flow rate, there is a stong possibility that with high flow rates oil already separated will be flushed-through into the outlet. On the other hand, the provision of an interceptor which is larger than necessary leads to unnecessary expenditure, so far as both the material and the installation costs are concerned. As a result, designers tend to specify an interceptor which has an adequate capacity for normal conditions taking into accound the part of the country where the interceptor is to be installed as well as the area of land from which surface water is to be collected and passed therethrough, a certain amount of flush-through being tolerated when abnormal conditions occur.

Inevitably, abnormal conditions—for example when there is a storm or a thaw—will occur and then abnormally high volume flow rates will pass through the interceptor. If emptying of the interceptor has not been carried out for some while, then there may be a most considerable quantity of oil in the interceptor separation chamber and the flush-through thereof may result in worse pollution than would have occurred had no interceptor been provided.

In an attempt to overcome the above-mentioned problem it has been suggested that an interceptor should be associated with a by-pass, which serves to divert abnormal water flow into a by-pass channel, such tthat the interceptor is protected form excessively high water flow rates so as to avoid flush-through of already separated oil. One known proposal for such a storm-water by-pass has involved a carefully calibrated sloping weir arrangement, but the construction of such a by-pass on site below ground greatly adds to the cost of an interceptor installation. It is thus a general object of this invention to provide an improved form of storm-water by-pass arrangement suitable for use for example with an interceptor, which by-pass may be made relatively compact but nevertheless still providing a reliable degree of protection for excessively high water flow rates.

Accordingly, this invention provides a storm-water by-pass comprising a first chamber, a second chamber located within the first chamber such that there is clearance at least partially around the second chamber whereby a space is provided between the walls of the two chambers, there being an aperture in the wall(s) of the second chamber permitting liquid communication between the two chambers, a liquid inlet pipe extending through the first chamber into the second chamber and arranged with its outlet below the normal liquid level in the second chamber, a feed pipe arranged to remove liquid from the second chamber the opening to which feed pipe faces upwardly with the edge of the opening at a predetermined level in the chamber, above the level of the outlet of the liquid inlet pipe, and an outlet for liquid from the first chamber, there being a weir over which liquid may flow in order to leave the first chamber through the outlet therefrom, the sill of which weir is positioned at a pre-determined height above the opening to the feed pipe in the second chamber, whereby during periods of abnormal flow rates the liquid level in the second chamber may rise until the liquid starts to flow over the weir to leave the by-pass through the outlet pipe so relieving the feed pipe of excessive flow rates therethrough.

In one preferred embodiment of this invention, the sill of the weir is defined by the lower edge of the aperture in the wall(s) of the second chamber such that when the liquid level in the second chamber rises (due to abnormal flow rates, in excess of that which can be handled by flow through the feed pipe), the excess flows over the weir into the second chamber and so out of the outlet pipe. This preferred embodiment does however have the disadvantage that if any oil has settled on the surface of liquid in the second

chamber, that settled oil might be flushed through the by-pass as flow commences over the weir. Accordingly, a more preferred embodiment of this invention has the aperture provided in the wall(s) of the second chamber at a relatively low level—for instance, at or next to the base of the by-pass—and the outlet pipe from the first chamber is associated with weir means mounted within the space between the two chambers and defining the weir sill at an appropriate level. For example, the weir means may be in the form of a gallery mounted on and extending at least part of the way around the inner wall of the first chamber, the sill of the weir being defined by an upstanding elongate edge of the gallery spaced from the first chamber wall. Most preferably, such a gallery is annular and continuous around the said walls, whereby a long weir sill is defined thereby: this allows large volume flow rate with only a small head above the weir sill. Moreover, in the event of a sudden large volume flow into the by-pass, the level in the second chamber will rise, so raising the level in the first chamber by flow through the low level aperture—but this will leave undisturbed any oil floating on the surface of liquid in the first chamber. The levels rise in both chambers until flow over the weir means into the outlet pipe may commence, so limiting the maximum head above the feed pipe opening in the second chamber.

In either embodiment of storm-water by-pass of this invention, inlet water—which may have an oil content—is supplied through the inlet pipe into the second chamber, below the normal level therewithin, as defined by the feed pipe, so as to minimise the disturbance of water already in the second chamber. Whenever sufficient water enters the second chamber to cause the level of water therein to rise above the opening to the feed pipe, water overflows into the feed pipe and is thus carried away for appropriate processing—for example, in an interceptor if an interceptor inlet pipe is connected to the feed pipe. When however the water flow rate into the second chamber rises above some pre-determined maximum value, (for instance in storm conditions), the feed pipe is unable to handle all of the inlet flow rate and the water level in the second chamber rises, until the water overflows the weir into the outlet pipe. The maximum head on the feed pipe, and so the volume flow therealong, is thus clamped by the weir. When the flow rate into the second chamber falls back to a more normal rate, the level in the second chamber will fall and all flow out of the second chamber once more will be through the feed pipe.

It has been established that the operation of the by-pass of this invention depends upon the flow characteristics of water into the feed pipe. For small flow rates, there is generally laminar flow over the edge of the feed pipe which thus acts as a weir. As the flow rate into the second chamber rises, the head above the edge of the feed pipe also rises, and the flow rate into that pipe increases accordingly. Eventually, as the head increases, a point is reached where the flow characteristics into the feed pipe suddenly change and a vortex flow is established instead of the laminar flow: this change is accompanied by a sudden increase in the head above the edge of the feed pipe. The weir permitting by-passing to occur should be positioned with respect to the opening of the feed pipe approximately mid-way between the limits of the sudden head increase mentioned above, so that there is no overflow (over the weir) so long as the flow into the feed pipe is laminar, but as soon as the flow characteristics into the feed pipe change, overflow starts to occur, so relieving the feed pipe of a further increase in head.

The determination of the correct area for the feed pipe as well as the vertical separation between the opening to the feed pipe and the lower edge of the overflow aperture is best determined empirically for any given installation, though some measure of calculation may assist in determining the optimum range for these parameters. Nevertheless, once sufficiently determined empirically, the performance of such a storm-water by-pass will be consistent and hence reliable protection of an associated interceptor may be expected when such a storm-water by-pass is put into service with an interceptor.

The storm-water by-pass of this invention employs 'nested' first and second chambers and this particular arrangement allows the provision of a most compact storm-water by-pass. Thus, the material cost thereof is relatively small and moreover the transport and installation costs may also be relatively low. Another advantage of the by-pass of this invention is that it particularly lends itself to pre-fabrication from glass-fibre reinforced plastics materials, so that at the site of installation, it is necessary to do no more than excavate a suitable hole in the ground into which the pre-fabricated by-pass may be fitted, and then to connect up the required pipe-work.

A preferred form of storm-water by-pass of this invention has the first and second chambers each of circular cylindrical form, with the second chamber nested concentrically within the first chamber and the axes thereof extending geneally vertically. Then, with such a concentric pair of chambers, the inlet pipe, outlet pipe and feed pipe can be disposed with whatever relative angular disposition suits the particular installation requirements, one or more apertures being provided at appropriate positions through the cylindrical wall of the second chamber. This arrangement permits the storm-water by-pass to be employed either with a new interceptor installation, for sinking in the ground at the same time as the interceptor itself, or with an already-existing interceptor installation, where a fresh hole is to be dug especially for the storm-water by-pass arrangement, in view of the ease with which the pipes may be disposed as required.

As an alternative to the first and second chamber each having a circular horizontal cross-sectional shape and nested concentrically one

within the other, it is possible to construct one or both of the chambers with other cross-sectional shapes. For example, the outer chamber may be of square or rectangular horizontal cross-sectional shape, whilst the second (inner) chamber remains of circular cross-section. Such an arrangement may be particularly advantageous where the storm-water by-pass is to be juxtaposed next to an interceptor, for very often interceptors are fabricated to have rectangular horizontal cross-sectional shapes.

It is possible to incorporate the storm-water by-pass of this invention as an integral part of an interceptor installation. For example, the first chamber may be attached to a side wall of the interceptor proper, particularly where the first chamber is of rectangular horizontal cross-sectional shape, but more preferably a compartment may be provided within the main interceptor chamber, which compartment directly serves as the first chamber of the by-pass, with the second chamber located therewithin. Such an integral assembly advantageously is made from a glass fibre reinforced plastics material and conveniently may comprise a tank provided with internal divisions as appropriate, to define the first chamber for the storm-water by-pass as well as one or more distinct separator chambers for the interceptor itself.

By way of example only, several specific embodiments of this invention will now be described in greater detail, reference being made to the accompanying drawings, in which:—

Figure 1 is a plan view of a first embodiment of storm-water by-pass of this invention, but with a cover removed for clarity;

Figure 2 is a vertical sectional view taken on line II—II marked on Figures 1 but including the cover;

Figure 3 is a view similar to that of Figure 2, but taken on line III—III marked on Figure 1;

Figures 4A and 4B show two alternative installation drawings for the storm-water by-pass of the Figures 1 to 3 in conjunction with an interceptor;

Figure 5 is a vertical cross-sectional view through a second embodiment of storm-water by-pass according to this invention and integrated with an interceptor;

Figure 6 is a plan view of the installation illustrated in Figure 5;

Figure 7 is a plan view of a third embodiment of storm-water by-pass of this invention, as installed with a single chamber interceptor, but with the by-pass cover removed for clarity;

Figure 8 is a sectional view of the installation of Figure 7, taken on line VIII—VIII marked on that Figure:

Figure 9 is a plan view of a fourth embodiment of this invention comprising a combination interceptor and storm-water by-pass, with the cover removed for clarity; and

Figure 10 is a sectional view of the arrangement of Figure 9, taken on line X—X marked on that Figure.

Referring initially to Figures 1 to 3, there is shown a first embodiment of storm-water by-pass, which comprises a first chamber 10 of circular cross-sectional shape and having a base wall 11, a cylindrical side wall 12 and a cover 13 provided with a central upstand 14 through which access may be gained to the interior of the chamber 10. When installed below the ground, the upstand 14 may be fitted with a manhole cover (not shown).

Within the first chamber 10 there is provided a second chamber 15, defined by a generally cylindrical side wall 16 affixed to the base wall 11 of the first chamber 10, the axial length of the side wall 16 being slightly less than that of the side wall 12. Cut through the upper part of the side wall 16 are two apertures 17, each of substantially rectangular shape and disposed so as to be generally diametrically opposed. Each aperture 17 has a lower edge 18 which extends parallel to the base wall 11 such that the lower edge 18 may serve as an overflow weir for water within the second chamber 15.

An inlet pipe 19 for the storm-water by-pass extends horizontally through the side walls 12 and 16 to communicate with the interior of the second chamber 15, there being a dip-pipe 20 for the inlet pipe, provided by a box-like structure provided on the inside surface of the side wall 16 over the opening to pipe 19. An outlet pipe 21 extends horizontally through the side wall 12, to permit water to leave the generally annular space between the side walls 12 and 16, the level of the lowest part of the outlet pipe 21 being lower than the level of the lower edge 18 of each aperture 17, and also being lower than the inlet level to the dip pipe 20.

Also provided within the second chamber 15 is a feed pipe 22 which ordinarily serves to take water from the second chamber 15 to an interceptor (not shown), whereat any oil may separate from the water. The feed pipe 22 includes a vertically extending portion 23 open at its upper end and connected at its lower end to an elbow 24, the elbow being carried by a generally horizontal pipe 25 extending through the side walls 16 and 12 of the second and first chambers respectively. The horizontal pipe 25 of the feed pipe 22 is connected to the inlet of a conventional interceptor, to feed water thereto below the ordinary water level in that interceptor.

The diameter of the vertical portion 23 and the distance 'd' between the uppermost edge of that vertical portion 23 and the lower edges 18 of the apertures 17 must carefully be pre-selected, having regard to the maximum flow rate which safely may be permitted through the interceptor without causing any flushing-through of oil already separated from water. The mechanism by which this feed pipe operates is that for low inlet water flow rates, the vertical portion 23 simply allows water to flow out of the second chamber 15, the feed pipe acting as a level pipe, but should an abnormally high inlet flow rate occur, then the water level in the second chamber 15 will rise due

to the inability of the pipe 23 to handle the increased inlet flow rate. When the water level rises to the lower edges 18 of the apertures 17, the water will flow thereover directly to enter the space between the first and second chambers 10 and 15 respectively. From there, as the water level in that space rises, the excess water will leave that space through the outlet pipe 21.

It will be appreciated that the by-pass described above particularly lends itself to manufacture by the moulding of glass-fibre reinforced synthetic resins, such that the complete by-pass can be made in a factory remote from the installation site. The pipes to and from the by-pass can be positioned knowing the requirements for the site, and the disposition of the inlet to the feed pipe 22 can accurately be preset relative to the lower edges 18 of the apertures 17, in accordance with empirically pre-determined data for the intended flow rates. The diameter of the feed pipe 22 should be similarly pre-selected.

Figures 4A and 4B show two possible installation configurations for a storm-water by-pass of this invention, in conjunction with an interceptor 26. In the arrangement of Figure 4A, which is particularly suitable for a new installation where the interceptor and storm-water.by-pass are to be sunk into the ground at the same time, the inlet pipe 19 and outlet pipe 21 are arranged generally diametrically opposed within the storm-water by-pass, with the feed pipe 22 disposed at 90° thereto—that is to say, generally as shown in Figure 1. The feed pipe 22 supplies ordinary water flows to the interceptor 26, and the outlet pipe 27 from the interceptor feeds back into a surface water drain 28, to which the outlet pipe 21 also is connected.

For the case where an interceptor has already been provided in a surface water drain, a storm-water by-pass such as that shown in Figure 4B is more suitable. Here, the feed pipe 22 is arranged to be generally diametrically opposed to the inlet pipe 19 such that the storm-water by-pass may readily be disposed in the existing pipeline 29 from a surface water gulley to the interceptor 30. The outlet pipe 21 is disposed at approximately 30° to the feed pipe 22, so that a by-pass pipeline 31 may readily be arranged to by-pass the interceptor 30 and to feed into the surface water drain downstream of the interceptor itself.

In view of the concentric circular arrangement of the first and second chambers 10 and 15, as described above, it will be appreciated that the inlet pipe 19, the outlet pipe 21 and the feed pipe 24 may be provided at almost any desired angle one with respect to the other, to suit any particular installation. Moreover, the aperture 17 cut in the side wall 16 defining the second chamber 15 also may be provided at any convenient angular location; this first embodiment of storm-water by-pass consequently may with great ease be manufactured to suit any particular installation circumstance.

Referring now to Figures 5 and 6, there is shown a second embodiment of this invention, wherein the storm-water by-pass is formed as an integral unit with a two-chamber interceptor. The complete apparatus of storm-water by-pass and single-chamber interceptor is provided within a single, generally rectangular, moulded glass fibre reinforced plastics tank 35, provided with a transverse dividing wall 36 and a longitudinal wall 37 extending between the transverse dividing wall 37 and the further end wall 38 of the tank 35. The smaller chamber defined by wall 37 serves as the first chamber 39 of the storm-water by-pass (corresponding to first chamber 10 of the first embodiment described above) and within that first chamber 39 there is provided a second chamber 40, defined by an upstanding cylindrical wall 41. An inlet pipe 42 together with an associated dip pipe 43, an interceptor feed pipe 44 and an outlet pipe 45 from the first chamber 39 are all provided in much the same manner as the inlet pipe 19 and dip pipe 20, feed pipe 22 and outlet pipe 21 of the first-described embodiment. Moreover, the cylindrical wall 41 defining the second chamber also is provided with a pair of apertures 46 each having a lower edge 47 defining an overflow weir for excess water flow rates into the second chamber 39. Normal flow rates into the second chamber enter the interceptor through the feed pipe 44, the feed pipe leading into a first section 48 of the interceptor below the normal water level therein. From there, the water flows into a second section 49 of the interceptor, through an aperture 50 provided in the long wall 32 adjacent the end wall 38, while separation of oil from the water occurs. From the second section 49, water leaves the interceptor through a dip pipe assembly 51, to flow into the first chamber 39, from where flow finally leaves the overall assembly through the outlet pipe 45. With abnormally high flow rates the level in the second chamber will rise until water overflows through the apertures 46 directly into the first chamber, thus protecting the interceptor from too great flow rates. It will thus be appreciated that both ordinary flow thjough the interceptor and abnormal flow, which runs over the weir defined by edges 47 of the apertures 46, enters the first chamber 39 to leave the installation through the outlet pipe 45. A cover plate 52 having two separate access up-stands 53 is provided, generally as shown in Figure 5.

This second embodiment of storm-water by-pass and interceptor as illustrated in Figures 5 and 6 provides an extremely compact apparatus which is easy to install and able to operate efficiency even with abnormal flow conditions which otherwise might flush-through oil already separated from water. The installation is much facilitated by virtue of the fact that inlet and outlet pipes are essentially aligned, and it is necessary to excavate only a single hole in which to install the apparatus.

Figure 7 and 8 show a further embodiment of

storm-water by-pass of this invention, as installed with a separate interceptor chamber. Though this embodiment is generally similar to that of the first embodiment, it is improved in that notwithstanding very high and sudden flow rates therethrough, any oil which may have separated from water within the by-pass itself will not be flushed through the by-pass, with the initial surge of water flow.

The by-pass of this third embodiment comprises a first chamber 60 of cylindrical cross-sectional shape within which is mounted a second chamber 61, also of cylindrical cross-sectional shape. The second chamber 61 is open at its upper end, and a cover 62 is provided for the first chamber 60, which cover has an access shaft 63 which, when the by-pass has been installed below ground, may be fitted with a manhole cover. The second chamber 61 has four apertures 64 provided adjacent the base thereof, which apertures permit free liquid communication between the two chambers. A water inlet pipe 65 is mounted on the first chamber 60 and has a downwardly extending portion 66 which feeds a pipe 67 leading to the interior of the second chamber 61, at a position well below the normal liquid level therewithin. In a similar manner as has been described above, a feed pipe 68 for an interceptor 69 is provided within the second chamber 61, which feed pipe 68 has a circular cross-sectional shape and the opening to which faces upwardly, so defining the normal liquid level within the second chamber 61.

Mounted internally of the first chamber 60, on the wall thereof, is an annular gallery 70 having an upstanding wall 71 around the inner edge thereof, spaced from the walls defining both the first and second chambers 60 and 61. The upper edge of this wall 71 defines a sill for the overflow weir and so this edge should be horizontal, when the by-pass is installed. The base wall 72 of the gallery 70 slopes down towards a location whereat there is provided an outlet pipe 73 for all water entering the by-pass through the inlet pipe 65. The interceptor chamber 69 is provided with an outlet dip pipe 74, which pipe feeds into the gallery 70 whereby flow through the interceptor chamber 69 also leaves the overall installation through the outlet pipe 73.

The operation of the third embodiment of by-pass described above is as follows. Under normal operating conditions, all inlet flow is drained from the second chamber 61 (to the level of the opening to the feed pipe 68) into the interceptor 69 and the outlet water, separated from oil, is fed into the gallery 70 from the interceptor through pipe 74. From there, the water may leave the installation through the outlet pipe 73. The water level within the first chamber 60 always is the same as that within the second chamber 61, by virtue of flow through the apertures 64.

Should an abnormally high inlet rate occur, the water level within the second chamber 61 will rise, owing to the flow characteristics through the feed pipe 68, and so also will the water level within the first chamber 60. Eventually, a point is reached where the water level has risen to such an extent that flow over the sill of the weir defined by wall 71 occurs, and water enters the gallery 70 directly, without first passing through the interceptor 69. From there, the water may leave the installation through the outlet pipe 73.

As compared to the first embodiment of this invention, this third embodiment has the added advantage that should any settlement take place in the second chamber 61, leading to oil floating on top of water within that second chamber, abnormal flow conditions will not cause such separated oil to be flushed through the by-pass; instead, that oil will eventually pass through the interceptor 69 and the water which overflows the weir into the gallery 70 will be removed from the lower region of the second chamber 61, through aperture 64.

Figures 9 and 10 show a fourth embodiment of this invention, comprising a combined by-pass and interceptor installation, somewhat similar to that described with reference to Figures 5 and 6, but incorporating a by-pass using the principles of construction of that described with reference to Figures 7 and 8. The interceptor section of this fourth embodiment is similar to that described above and will not therefore be described again here; parts similar to those described above are given like reference characters and also will not be described again.

In the arrangement of Figures 9 and 10, the storm-water by-pass is defined by a first chamber 80 of generally rectangular shape, within which is mounted a cylindrical second chamber 61. A shelf is fitted within the first chamber 80, which shelf slopes downwardly from the inlet pipe 65 to the outlet pipe 73 from the installation, fitted in a side wall of the chamber 80 above the shelf 81. The shelf 81 has a circular opening which surrounds with considerable clearance the second chamber 61, there being an upstanding wall 70 provided around the edge of that circular opening which wall defines the storm overflow weir. The interceptor feed pipe 44 is arranged as described with reference to the second embodiment, as is the interceptor outlet dip pipe 51, feeding into the first chamber 80, above the shelf 81.

The operation of this fourth embodiment of interceptor is essentially the same as that which has been described above with reference to Figures 7 and 8, in that should there be an accumulation of oil within the second chamber 61, that accumulation will not be flushed through the by-pass, during abnormal storm flow conditions.

Claims

1. A storm-water by-pass comprising a first chamber, a second chamber located within the first chamber such that there is a clearance at least partially around the second chamber whereby a space is provided between the walls of the two chambers, there being an aperture in the wall(s) of the second chamber permitting liquid

communication between the two chambers, a liquid inlet pipe extending through the first chamber into the second chamber and arranged with its outlet below the normal liquid level in the second chamber, a feed pipe arranged to remove liquid from the second chamber the opening tow which feed pipe faces upwardly with the edge of the opening at a pre-determined level in the chamber, above the level of the outlet of the liquid inlet pipe, and an outlet for liquid from the first chamber, there being a weir over which liquid may flow in order to leave the first chamber through the outlet therefrom, the sill of which weir is positioned at a pre-determied height above the opening to the feed pipe in the second chamber, whereby during periods of abnormal flow rates the liquid level in the second chamber may rise until the liquid starts to flow over the weir to leave the by-pass through the outlet pipe so relieving the feed pipe of excessive flow rates therethrough.

2. A storm-water by-pass according to claim 1, wherein the sill of the weir is defined by the lower edge of the aperture in the wall(s) of the second chamber such that when the liquid level in the second chamber rises excess liquid may flow over the weir into the second chamber and so out of the outlet pipe.

3. A storm-water by-pass according to claim 1, wherein the aperture provided in the wall(s) of the second chamber at a relatively low level and the outlet pipe from the first chamber is associated with weir means mounted within the space between the two chambers and defining the weir sill at an appropriate level.

4. A storm-water by-pass according to claim 3, wherein the weir means is in the form of a gallery mounted on and extending at least part of the way around the inner wall of the first chamber, the sill of the weir being defined by an upstanding elongate edge of the gallery spaced from the first chamber wall.

5. A storm-water by-pass according to claim 4, wherein the gallery is annular and continuous around the said walls of the first chamber.

6. A storm-water by-pass according to any of the preceding claims, wherein the first and second chambers are each of circular cylindrical form, with the second chamber nested concentrically within the first chamber and the axes thereof extending generally vertically.

7. A storm-water by-pass according to any of claims 1 to 5, wherein the first chamber has a square or rectangular horizontal cross-sectional shape, and the second chamber has circular cross-sectional shape.

8. A storm-water by-pass according to any of the preceding clams, wherein the by-pass is provided as an integral part of an interceptor installation.

9. A storm-water by-pass according to claim 8, wherein the interceptor chamber defines a compartment provided therewithin, which compartment directly serves as the first chamber of the by-pass, with the second chamber located therewithin.

10. A storm water by-pass according to claim 9, wherein the integral assembly is made from a glass fibre reinforced plastics material.

11. A storm-water by-pass according to claim 1 and substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 4 or in Figures 5 and 6 or in Figures 7 and 8 or in Figures 9 and 10 of the accompanying drawings.

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